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PATENT SPECIFICATION 756,357

Inventors :—GEORGE RICHARD ROBERTS, RONALD THOMAS HEATHCOTE and ERNEST JAMES LISTER.

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COMPLETE SPECIFICATION.

Severing Means in Web Feeding Machines.

We, BOWATERS DEVELOPMENT AND RESEARCH LIMITED, a Company organised under the laws of Great Britain, of Bowater House, Stratton Street, London, W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention comprises improvements in web feeding machines wherein the web is drawn from a supply and is cut into pre-determined lengths by a pair of guillotine drums.

It is known to incorporate in web feeding machines a pair of guillotine drums equipped with resilient segments on their surfaces so that the web is gripped during the cutting operation.

The object of this invention is to provide an improved control of the cutting operation and of the continued web feeding after cutting has taken place.

According to the invention, in a web feeding machine comprising means for drawing the web from a supply and a pair of co-operating guillotine drums between which the web passes in the course of its travel and by which it is cut when a pre-determined length has passed, the guillotine drums and the actuating means therefor are so arranged that the web has normally free passage between the drums, but when the web is to be cut the drums are displaced out of their normal disposition to grip the web and to be rotated thereby until the web is cut, a positive drive being then applied to the drums to feed forward the web behind the cut for engagement with the web drawing means, after which feeding operation the drums are restored to their normal disposition.

The actuating means for the drums are preferably such as to produc a rotary displacement, the drum surfaces being such that portions thereof are brought together to grip and cut the web when said displacement is effected. These portions of the drum may be elements hinged about axes parallel to the drum axes and spring-urged outwardly.

A spring loaded member may be provided to actuate the rotary displacement of the drums, means being provided for automatically releasing the spring loaded member when the predetermined length of web has passed between the drums. Thus, for example, the two drums are geared together and the spring loading operates on a toothed rack which co-acts with a toothed quadrant fixed to one drum.

The aforesaid positive drive may be applied to the drums by a driving motor connected to the drums through engageable and disengageable unidirectional transmission elements adapted to be automatically put into engagement when the web is cut, the motor being adapted to drive the drums at a speed substantially lower than that due to the draw of the web before the cutting takes place.

Means may be provided for reducing the take-off of the web from a supply when the drums are rotating at the lower speed. These means preferably comprise a roll about which the web is entrained and which is displaceable according to the tension of the web, and brake means acting at the web supply and actuated by displacement of said roll.

The present invention may be used in a convolute drum winder comprising the features described in any of our co-pending Applications Nos. 19562/53, 19563/53 and 19564/53 (Serial Nos. 756,354, 756,355, 756,356).

An embodiment of the invention as applied to a convolute drum winder will now be described with reference to the drawings accompanying the Provisional Specification in which :—

Figure 1 is a diagrammatic side elevation of a convolute drum winder; and

Figure 2 is a detail of part of Figure 1 on a larger scale and in vertical section.

Referring now to Figure 1 a web of paper W in its normal course of travel is drawn from an unwinding reel 1, over a fixed roll 2, a compensator roll 3 and a further fixed roll 4; thence between guillotine drums 5 and 6 and over a glue roll 7 to a winding mandrel 8. The web W is maintained in contact with the glue roll by a pressure bar 9.

The compensator roll 3 is rotatably mounted on an arm 10 pivoted to the machine frame (not shown) at 11. An extension 12 of the arm 10 is pivotally connected at 13 to a rod 14, the other end of which is pivotally connected at 15 to a bell crank 16. The latter is pivoted to the machine frame at 17. A tension spring 18 is connected to the arm 10 on one end and anchored to the machine frame at the other.

The unwinding reel 1 is provided with a brake band 19 anchored at one end 20 and connected at the other end 21 to a pivoted arm 22. The end 23 of the latter is pivotally connected to a rod 24 provided with a fixed collar 25.

Referring now to Figure 2 the construction of each of the guillotine drums 5 and 6 is generally similar, and although for clarity some parts are shown only on one drum, they are common to both with the exception of the knives as will hereinafter be described. The structure of each drum comprises a plurality of polygonal frames 26 spaced along the length of the drum. The structure also comprises a channelled member 27 in which is secured an angle bracket 28 for the mounting of a knife 29 or 30. The knife 30 is bolted directly to the angle bracket 28 and is set with its cutting edge along a line parallel to the axis of the drum.

The length of the knife 29 is in two halves set slightly divergently from one another so that their junction in the middle is a little behind a line, parallel to the axis of the drum, joining their outer ends. The setting of this knife is controlled by bolts 31 and lock nuts 32.

Two portions 33 and 34 of the drums shells are pivoted at 35 and 36 respectively to the structure frames 26. These portions are biased away from the drum centre by springs, one of which is shown at 37. This is mounted in a sleeve 38 having a cap 39 engaging a cradle 40 carried on the pivoted portion 33. The position of the spring 37 may be adjusted by a threaded pin 41 passing through a yoke piece 42, keyed to the shaft 43 of th drum. Also carried by the yoke piece 41 is a rod 44 pivotally connected at 45 to the pivoted portion 33, the rod being threaded at its other end to receive a lock nut 46 serving to limit the outward position of the pivoted portion 33.

The remainder of the drum shell comprises segments 47 bolted to the frames 26 and all but a segment 48 is covered with a layer of rubber 49.

Returning now to Figure 1 the guillotine drums are geared together and are driven from a motor 50 through a worm 51 on a shaft 52. Meshing with the worm 51 is a worm wheel 53, connected to a ratchet wheel 54, both being free on the shaft 55 of the guillotine drum 6. Keyed to the shaft 55 is a plate 56 which on one side carries a pivoted lever 57 and on its other side a pawl 58 connected to the lever. The plate 56 is also provided with a recess 59 engageable by a spring loaded catch 60. A cam plate 61 is fixed to the frame of the machine and so arranged that it forms a riding surface for the lever 57.

The guillotine drum 5 is fixed to its shaft 43, and freely mounted on this shaft is a disc formed with a toothed segment 62 and provided with a notch 63. Keyed to the shaft 43 is a cam plate 64 having a cam surface 65 and carrying a catch 66.

Fixed to the machine frame above the guillotine drum 5 is a toothed rack 67 carried in a closed guide 68 and an open guide 69. A compression spring 70 is provided between one end of the toothed rack and the closed end of the guide 68; fixed to the rack 67 is a collar 71 provided with two pegs, one of which is shown at 72. A yoke piece 73 is pivoted to the frame of the machine at 74, its end 75 being in contact with the pegs 72 and the other end carrying a roller 76. A pivoted catch 77 is provided adapted to engage the collar 71 and to be controlled by a solenoid 78.

In operation, during the winding of the web W on to the mandrel 8, the components are disposed as shown in Figure 1, the web W being drawn by the mandrel 8 from the unwinding reel 1 over the fixed roll 2, around the compensator roll 3, over the fixed roll 4 and between the guillotine drums 5, 6, remaining out of contact therewith due to the uncovered segments 48 of their surfaces; it then passes over the glue roll 7 and on to the winding mandrel 8. The motor 50 is running and driving the worm wheel 53 and ratchet wheel 54 through the worm 51. The drums are stationary, the plate 56 is held against displacement by the spring loaded catch 60 and the pawl 58 is free of the ratchet wheel 54.

When a predetermined length of the paper has been wound on the mandrel 8, the solenoid 78 is operated to lift the catch 77. When the catch is raised the spring 70 pushes the toothed rack 67 to the right. The rack engages with the toothed segment 62 and the cam plate 64 is rotated through the notch 63 and catch 66, thus rotating the drums. The

spring loaded catch 60 is forced out of the detent 59 and the drums move to the extent that the hinged members 33 grip the web W. The web in its travel towards the left then rotates the drums until it is sheared by the co-operating knives 29 and 30.

That portion of the web behind the cut is gripped by the pivoted members 34 and by this time the lever 57 has cleared the bulge of the cam plate 61 so that the pawl 58 is riding on the ratchet wheel 54. As soon as the speed of rotation of the drums has fallen to that of the ratchet wheel 54 they will be driven by the motor 50 through the pawl 58 and the ratchet 54. By this time the catch 66 has cleared the notch 63 on the plate 62. As the drums are driven by the motor 50 they feed the uncut portion of the web W forward in preparation for a further winding.

The driving speed of rotation of the drums 5 and 6 is substantially slower than the speed of rotation when they are drawn by the web and therefore the unwinding reel must be slowed down. As the web is cut the tension in that portion of the web behind the cut falls. This allows the arm 10 carrying the compensator roll 3 to fall under the action of the spring 18. As it falls the bell crank 16 engages the collar 25 and so applies the brake to the unwinding reel 1 through the rod 24 and the pivoted lever 22. As soon as the unwinding reel slows down the tension in the web will increase, the arm 10 will rise against the tension in the spring 18 and the bell crank 16 will be moved to the position shown in Figure 1, thus releasing the brake on the unwinding reel.

As the guillotine drums continue to rotate the portion 65 of the cam plate 64 will engage the roller 76 and through the yoke piece 73 will push the toothed rack 57 to the left until the collar 71 is caught by the catch 77. On further rotation the lever 57 will ride on the bulge of the cam plate 61 and raise the pawl 58 from the ratchet wheel 54, and the spring loaded catch 60 will enter the detent 59 to hold the drums in the position shown in Figure 1 until the solenoid 78 is operated and the cycle repeated.

As the tail of the severed web W passes over the glue roll 7, the pressure bar 9 is raised by means (not shown) which may for example be connected to the guillotine drums 5 and 6, which feed the leading edge of the uncut web W towards the mandrel 8. Guide plates (not shown) may be provided to guide and support the web over the glue roll 7 and into contact with the surface of the mandrel 8, against which surface the web may be held by suction means for a further winding. If such arrangement is used to guide the leading edge of the uncut web to the mandrel 8, then the distance between the line of cutting of th guillotine drums and the mandrel, must be less than the peripheral distance around the face of the guillotine drums, excluding th uncovered segment.

In order further to ensure against the uncut portion of th web slipping back due to the pull of the compensator roll, there may be provided a table between the roll 4 and the guillotine drums for the web to pass over, and a number of hinged fingers with rubber pads resting on the top of the web so that the web will be gripped if it tends to pull back.

What we claim is:—

1. In a web feeding machine comprising means for drawing the web from a supply and a pair of co-operating guillotine drums between which the web passes in the course of its travel and by which it is cut when a predetermined length has passed, an arrangement of the guillotine drums and of actuating means therefor such that the web has normally free passage between the drums, but when the web is to be cut the drums are displaced out of their normal disposition to grip the web and to be rotated thereby until the web is cut, a positive drive being then applied to the drums to feed forward the web behind the cut for engagement with the web drawing means, after which feeding operation the drums are restored to their normal disposition.

2. A machine having the arrangement according to Claim 1 in which the actuating means for the drums produce a rotary displacement, and the drum surfaces are such that portions thereof are brought together to grip and cut the web when said displacement is effected.

3. A machine having the arrangement according to Claim 2 in which a spring loaded member is provided to actuate the rotary displacement and means are provided for automatically releasing the spring loaded member when the predetermined length of web has passed between the drums.

4. A machine having the arrangement as claimed in Claim 3 in which the drums are geared together and in which the spring loading operates on a toothed rack which co-acts with a toothed quadrant coupled to one drum by a pawl and rachet mechanism.

5. A machine having the arrangement as claimed in any of the preceding claims in which a driving motor for applying a positive drive to the drums is connected to the drums through engageable and disengageable transmission elements adapted to be automatically put into engagement when the web is cut.

6. A machine having the arrangement as claimed in Claim 5 in which the drive engagement between the transmission elements is unidirectional.

7. A machine having the arrangement as claimed in any of Claims 2 to 6, in which a portion of a drum surface adapted for gripping the web is a section which is displaceably

connected with the drum proper and is spring urged away from the centre of the drum.

8. A machine having the arrangement as claimed in any of Claims 2—6 in which a portion of a drum surface adapted for gripping the web is a section hinged about an axis parallel to that of the drum, the end of each section remote from the hinge being spring urged away from the centre of the drum.

9. A machine having the arrangement as claimed in any of the preceding claims in which the positive drive is adapted to rotate the drums at a speed which is substantially lower than that due to the draw of the web.

10. A machine as claimed in Claim 9 in which means are provided for automatically reducing the take-off of the web from the supply when the drums are rotating at the lower speed.

11. A machine according to Claim 10 in which the means for automatically reducing the take-off of the web comprises a roll about which the web is entrained and which is displaceable according to the tension of the web and brake means acting at the web supply and actuated by displacement of said roll.

12. A web feeding machine having an arrangement of guillotine drums and actuating means therefor substantially as described and shown in the drawings accompanying the Provisional Specification.

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PROVISIONAL SPECIFICATION.

Severing Means in Web Feeding Machines.

We, BOWATERS DEVELOPMENT AND RESEARCH LIMITED, a Company organised under the laws of Great Britain, of Bowater House, Stratton Street, London, W.1, do hereby declare this invention to be described in the following statement :—

This invention comprises improvements in web feeding machines wherein the web is drawn from a supply and is cut into predetermined lengths by a pair of guillotine drums.

It is known to incorporate in web feeding machines a pair of guillotine drums equipped with resilient segments on their surfaces so that the web is gripped during the cutting operation.

The object of this invention is to provide an improved control of the cutting operation and of the continued web feeding after cutting has taken place.

According to the invention, in a web feeding machine comprising means for drawing the web from a supply and a pair of co-operating guillotine drums between which the web passes in the course of its travel and by which it is cut when a pre-determined length has passed, the guillotine drums and the actuating means therefor are so arranged that the web has normally free passage between the drums, but when the web is to be cut the drums are displaced out of their normal disposition to grip the web and to be rotated thereby until the web is cut, a positive drive being then applied to the drums to feed forward the web behind the cut for engagement with the web drawing means, after which feeding operation the drums are restored to their normal disposition.

The actuating means for the drums are preferably such as to produce a rotary displacement, the drum surfaces being such that portions thereof are brought together to grip and cut the web when said displacement is effected. These portions of the drum may be elements hinged about axes parallel to the drum axes and spring-urged outwardly.

A spring loaded member may be provided to actuate the rotary displacement of the drums, means being provided for automatically releasing the spring loaded member when the predetermined length of web has passed between the drums. Thus, for example, the two drums are geared together and the spring loading operates on a toothed rack which co-acts with a toothed quadrant fixed to one drum.

The aforesaid positive drive may be applied to the drums by a driving motor connected to the drums through engageable and disengageable unidirectional transmission elements adapted to be automatically put into engagement when the web is cut, the motor being adapted to drive the drums at a speed substantially lower than that due to the draw of the web before the cutting takes place.

Means may be provided for reducing the take-off of the web from a supply when the drums are rotating at the lower speed. These means preferably comprise a roll about which the web is entrained and which is displaceable according to the tension of the web, and brake means acting at the web supply and actuated by displacement of said roll.

The present invention may be used in a convolute drum winder comprising the features described in any of our co-pending Applications Nos. 19562/53 ; 19563/53 and

19564/53 (Serial Nos. 756,354, 756,355 and 756,356).

An embodiment of the invention as applied to a convolute drum winder will now be described with reference to the accompanying drawings in which :—

Figure 1 is a diagrammatic side elevation of a convolute drum winder ; and

Figure 2 is a detail of part of Figure 1 on a larger scale and in vertical section.

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The compensator roll 3 is rotatably mounted on an arm 10 pivoted to the machine frame (not shown) at 11. An extension 12 of the arm 10 is pivotally connected at 13 to a rod 14, the other end of which is pivotally connected at 15 to a bell crank 16. The latter is pivoted to the machine frame at 17. A tension spring 18 is connected to the arm 10 on one end and anchored to the machine frame at the other.

The unwinding reel 1 is provided with a brake band 19 anchored at one end 20 and connected at the other end 21 to a pivoted arm 22. The end 23 of the latter is pivotally connected to a rod 24 provided with a fixed collar 25.

Referring now to Figure 2 the construction of each of the guillotine drums 5 and 6 is generally similar, and although for clarity some parts are shown only on one drum, they are common to both with the exception of the knives as will hereinafter be described. The structure of each drum comprises a plurality of polygonal frames 26 spaced along the length of the drum. The structure also comprises a channelled member 27 in which is secured an angle bracket 28 for the mounting of a knife 29 or 30. The knife 30 is bolted directly to the angle bracket 28 and is set with its cutting edge along a line parallel to the axis of the drum.

The length of the knife 29 is in two halves set slightly divergently from one another so that their junction in the middle is a little behind a line, parallel to the axis of the drum, joining their outer ends. The setting of this knife is controlled by bolts 31 and lock nuts 32.

Two portions 33 and 34 of the drum shells are pivoted at 35 and 36 respectively to the structure frames 26. These portions are biased away from the drum centre by springs, one of which is shown at 37. This is mounted in a sleeve 38 having a cap 39 engaging a cradle 40 carried on the pivoted portion 33. The position of the spring 37 may be adjusted by a threaded pin 41 passing through a yoke piece 42, keyed to the shaft 43 of the drum. Also carried by the yoke piece 41 is a rod 44 pivotally connected at 45 to the pivoted portion 33, th rod being threaded at its other end to receive a lock nut 46 serving to limit the outward position of the pivoted portion 33.

The remainder of the drum shell comprises segments 47 bolted to the frames 26 and all but a segment 48 is covered with a layer of rubber 49.

Returning now to Figure 1 the guillotine drums are geared together and are driven from a motor 50 through a worm 51 on a shaft 52. Meshing with the worm 51 is a worm wheel 53, connected to a ratchet wheel 54, both being free on the shaft 55 of the guillotine drum 6. Keyed to the shaft 55 is a plate 56 which on one side carries a pivoted lever 57 and on its other side a pawl 58 connected to the lever. The plate 56 is also provided with a recess 59 engageable by a spring loaded catch 60. A cam plate 61 is fixed to the frame of the machine and so arranged that it forms a riding surface for the lever 57.

The guillotine drum 5 is fixed to its shaft 43, and freely mounted on this shaft is a disc formed with a toothed segment 62 and provided with a notch 63. Keyed to the shaft 43 is a cam plate 64 having a cam surface 65 and carrying a catch 66.

Fixed to the machine frame above the guillotine drum 5 is a toothed rack 67 carried in a closed guide 68 and an open guide 69. A compression spring 70 is provided between one end of the toothed rack and the closed end of the guide 68 ; fixed to the rack 67 is a collar 71 provided with two pegs, one of which is shown at 72. A yoke piece 73 is pivoted to the frame of the machine at 74, its end 75 being in contact with the pegs 72 and the other end carrying a roller 76. A pivoted catch 77 is provided adapted to engage the collar 71 and to be controlled by a solenoid 78.

In operation, during the winding of the web W on to the mandrel 6, the components are disposed as shown in Figure 1, the web W passes from the unwinding reel 1 over the fixed roll 2, around the compensator roll 3, over the fixed roll 4 and between the guillotine drums 5, 6, remaining out of contact therewith due to the uncovered segments 48 of their surfaces ; it then passes over the glue roll 7 and on to the winding mandrel 8. The motor 50 is running and driving the worm wheel 53 and ratchet wheel 54 through the worm 51. The drums are stationary, the plate 56 is held against displacement by the spring loaded catch 60 and the pawl 58 is free of the ratchet wheel 54.

When a predetermined length of the paper has been wound on the mandrel 8, the solenoid 78 is operated to lift the catch 77. When the catch is raised the spring 70 pushes the toothed rack 67 to the right. The rack en-

gages with the toothed segment 62 and the cam plate 64 is rotated through the notch 63 and catch 66, thus rotating the drums. The spring loaded catch 60 is forced out of the detent 59 and the drums move to the extent that the hinged members 33 grip the web W The web in its travel towards the left then rotates the drums until it is sheared by the co-operating knives 29 and 30.

That portion of the web behind the cut is gripped by the pivoted members 34 and by this time the lever 57 has cleared the bulge of the cam plate 61 so that the pawl 58 is riding on the ratchet wheel 54. As soon as the speed of rotation of the drums falls below that of the ratchet wheel 54 they will be driven by the motor 50 through the pawl 58 and the ratchet 54. By this time the catch 66 has cleared the notch 63 on the plate 62. As the drums are driven by the motor 50 they feed the uncut portion of the web W forward in preparation for a further winding.

The driving speed of rotation of the drums 5 and 6 is substantially slower than the speed of rotation when they are drawn by the web W and therefore the unwinding reel must be slowed down. As the web is cut the tension in that portion of the web behind the cut falls. This allows the arm 10 carrying the compensator roll 3 to fall under the action of the spring 18. As it falls the bell crank 16 engages the collar 25 and so applies the brake to the unwinding reel 1 through the rod 24 and the pivoted lever 22. As soon as the unwinding reel slows down the tension in the web will increase, the arm 10 will rise against the tension in the spring 18 and the bell crank 16 will be moved to the position shown in Figure 1, thus releasing the brake on the unwinding reel.

As the guillotine drums continue to rotate the portion 65 of the cam plate 64 will engage the roller 76 and through the yoke piece 73 will push the toothed rack 67 to the left until the collar 71 is caught by the catch 77. On further rotation the lever 57 will ride on the bulge of the cam plate 61 and raise the pawl 58 from the ratchet wheel 54, and the spring loaded catch 60 will enter the detent 59 to hold the drums in the position shown in Figure 1 until the solenoid 78 is operated and the cycle repeated.

In order further to ensure against the uncut portion of the web slipping back due to the pull of the compensator roll, there may be provided a table between the roll 4 and the guillotine drums for the web to pass over, and a number of hinged fingers with rubber pads resting on the top of the web so that the web will be gripped if it tends to pull back.

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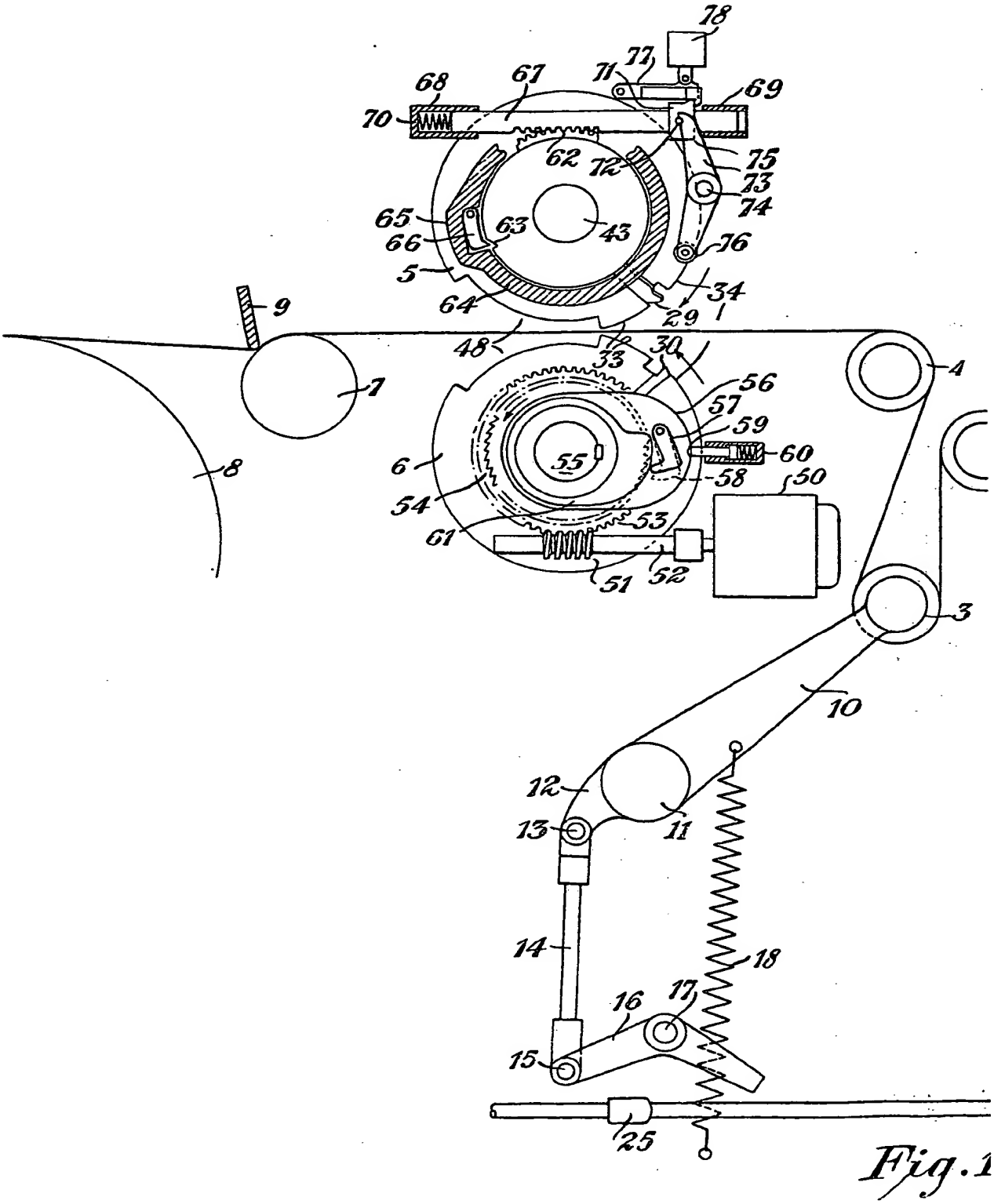

Fig. 1

756,357 PROVISIONAL SPECIFICATION
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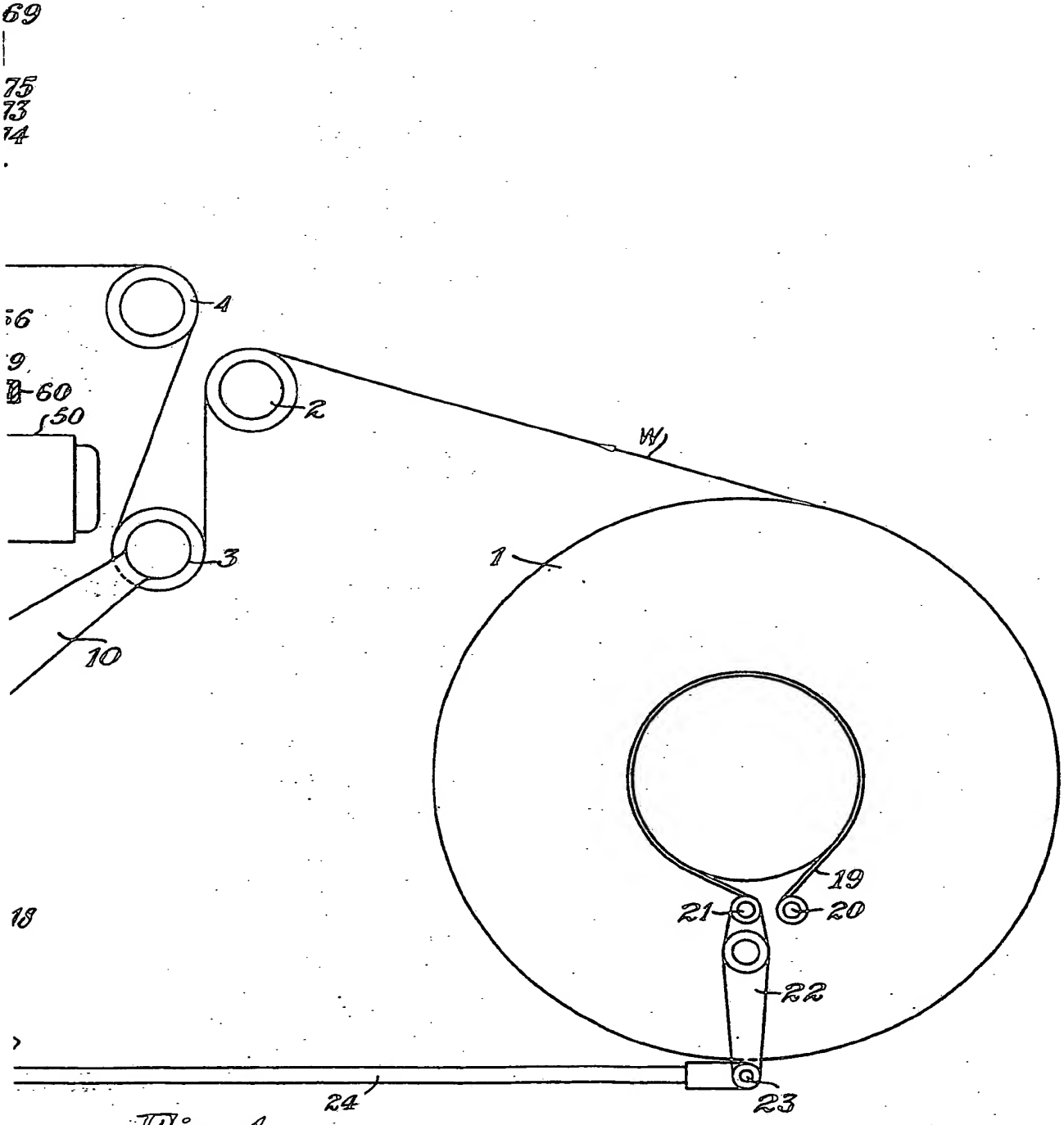

Fig. 1.

756,357 PROVISIONAL SPECIFICATION
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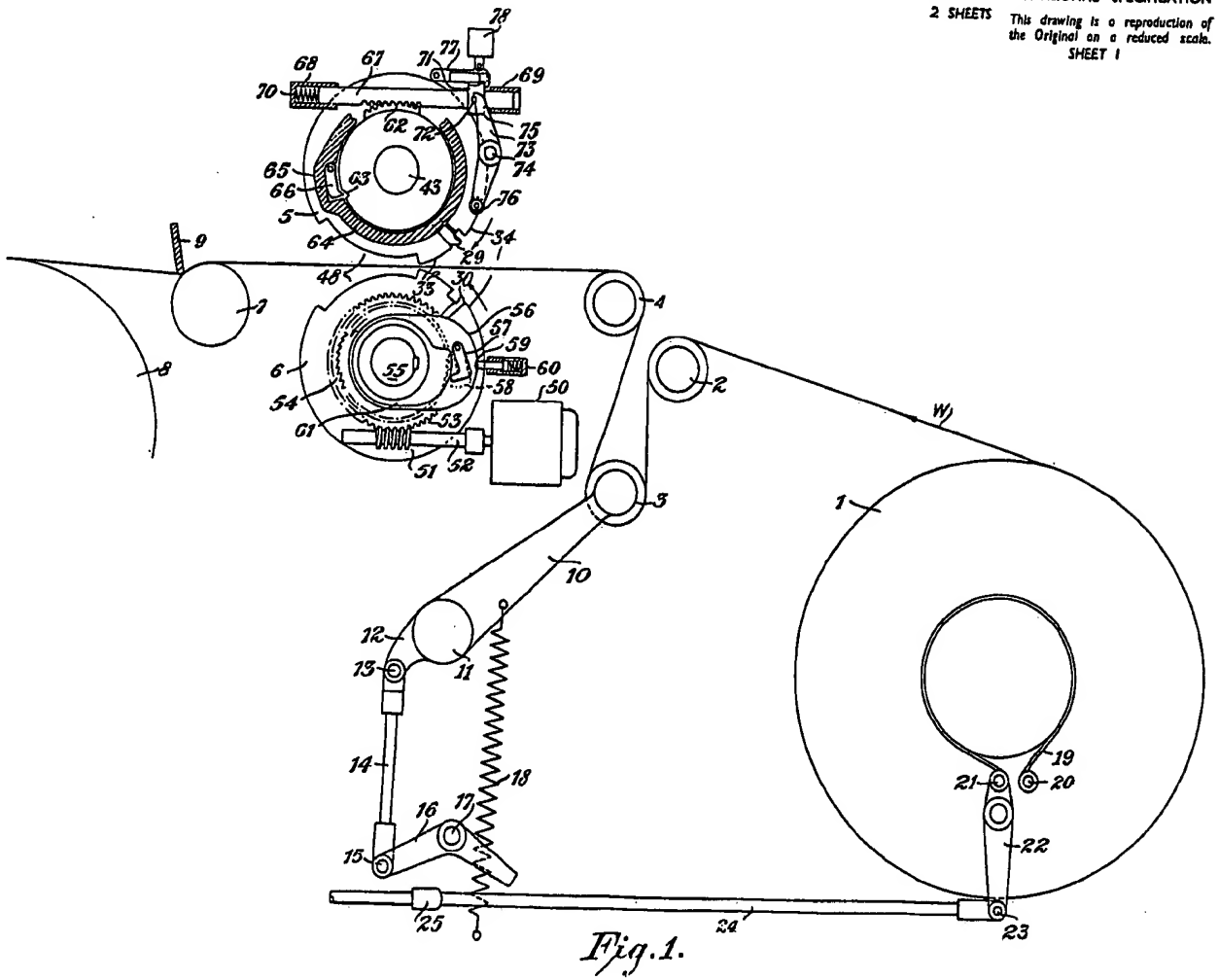
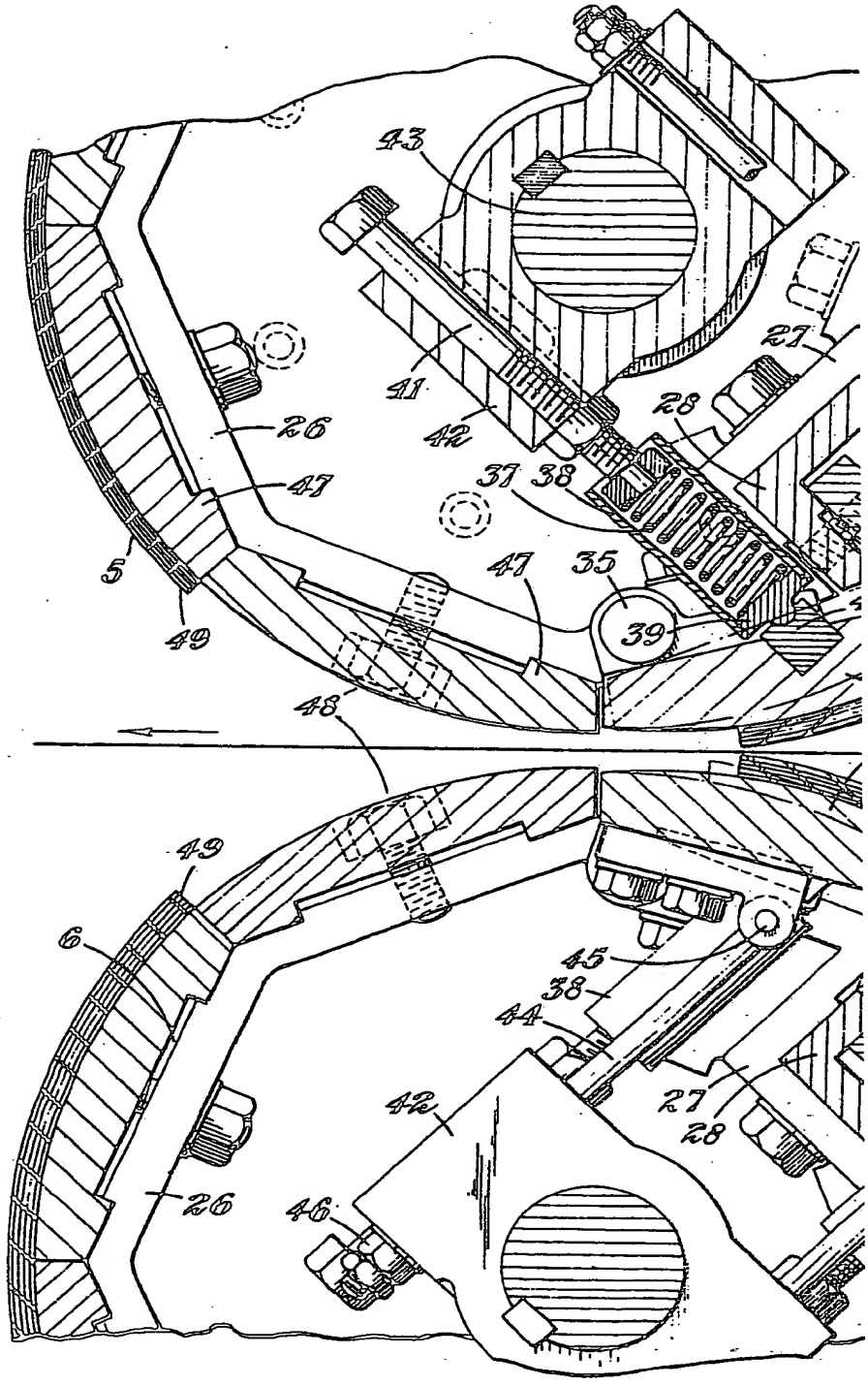


Fig. 1.



756,357 PROVISIONAL SPECIFICATION
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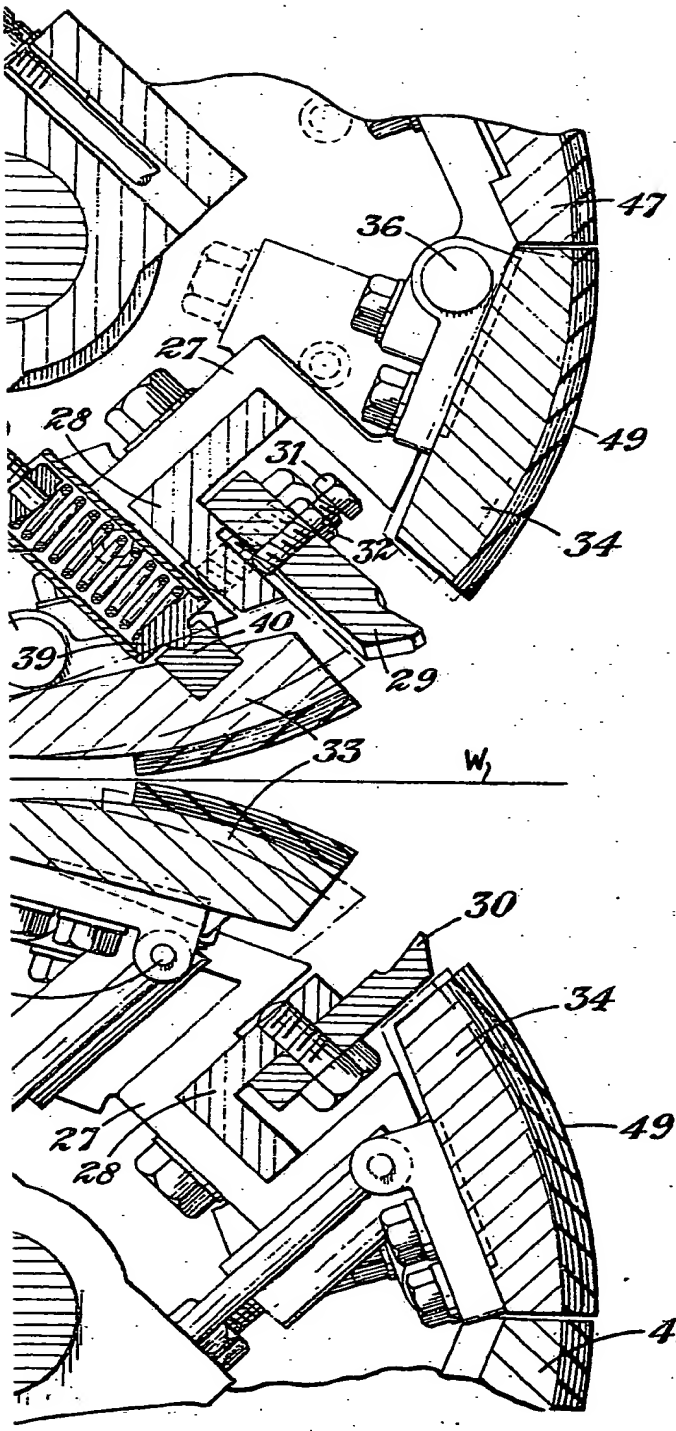

Fig. 2.

756,357 PROVISIONAL SPECIFICATION
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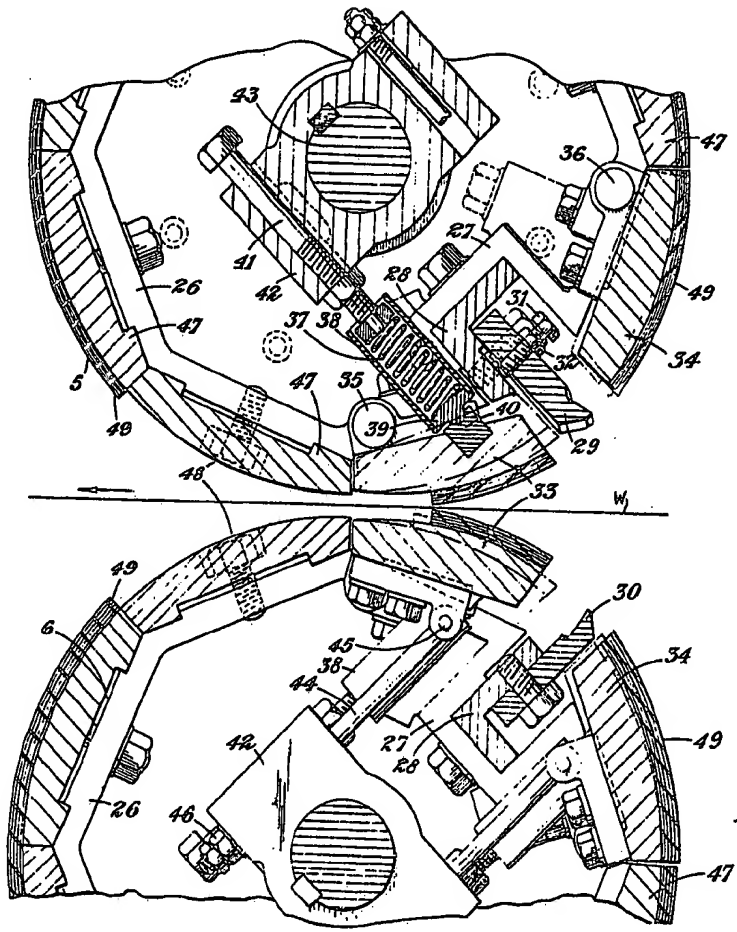

Fig. 2.